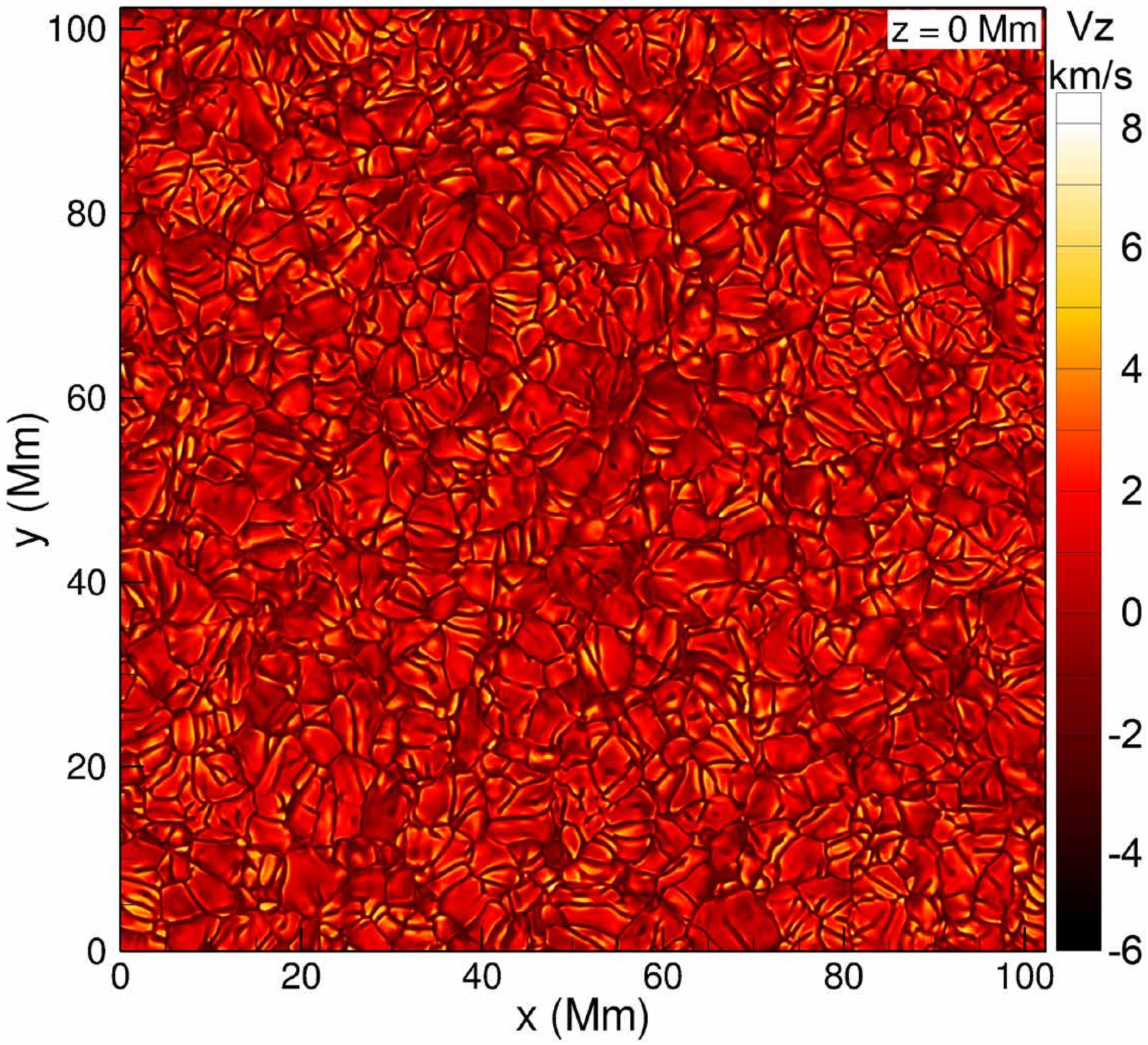
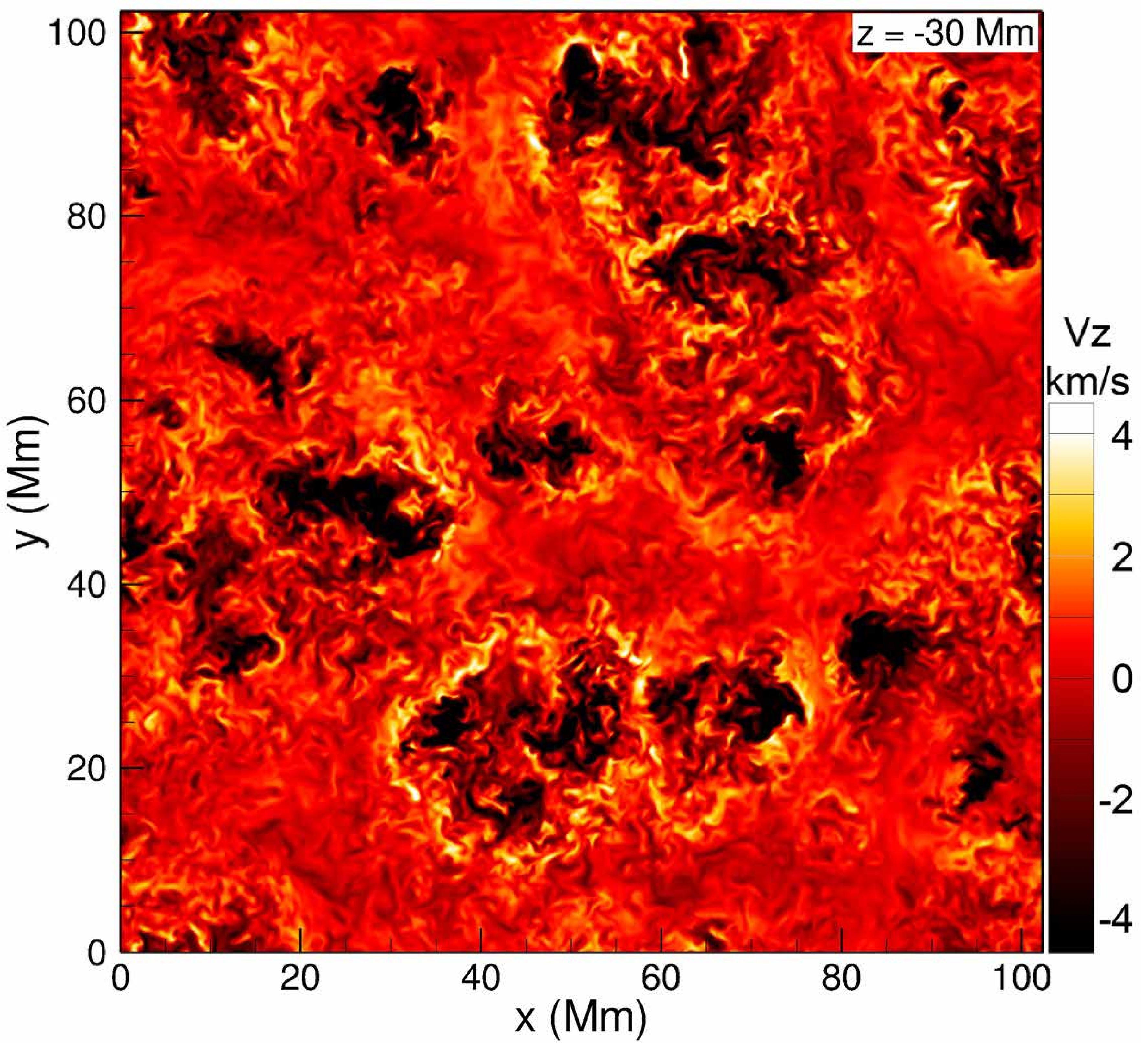


Surface vertical (radially outward) velocity for a star 1.47 times the mass of the Sun. The scale on the right shows the color values in km/sec. Such a plot is analogous to pictures of the Sun that show so-called granulation—the pattern of moving and radiating plasma as it appears at the surface. For heavy stars like this one, the granulation has multiple size scales: some very small granules, roughly 1–3 megameters (Mm) in size, similar to those on the Sun; and another group 5–10 Mm in size. *Irina Kitiashvili, NASA/Ames*



Vertical (radially outward) velocity for a star 1.47 times the mass of the Sun at the tachocline—the interface between the outer convective zone and the stellar core—which, for this star, is 30 megameters below the surface. Note the completely different pattern of flow as compared to the surface velocities shown in the image above. The negative velocities (dark colors) constitute so-called "convective overshoot," a phenomenon known to occur on the Sun. *Irina Kitiashvili, NASA/Ames*

National Aeronautics and
Space Administration

Supercomputing Stars

Understanding how stars work is one of the greatest achievements of the human intellect, but not all of the science is known in detail. Like Earth's climate, the physics of stars is too complex to be fully described by a simple theory. Instead, supercomputers are used to solve equations representing the events inside the stars and their atmospheres. While very powerful, today's supercomputers can only begin to characterize the rich detail of stellar phenomena, but we can compute results that are both scientifically relevant and beautiful. We are running several large simulations of stars more massive than the Sun on the Pleiades supercomputer. Because of their greater masses, the convective zones of these stars are thinner than the Sun's, so the zones can be simulated in their entirety on current computers.

Alan Wray, Ames Research Center